

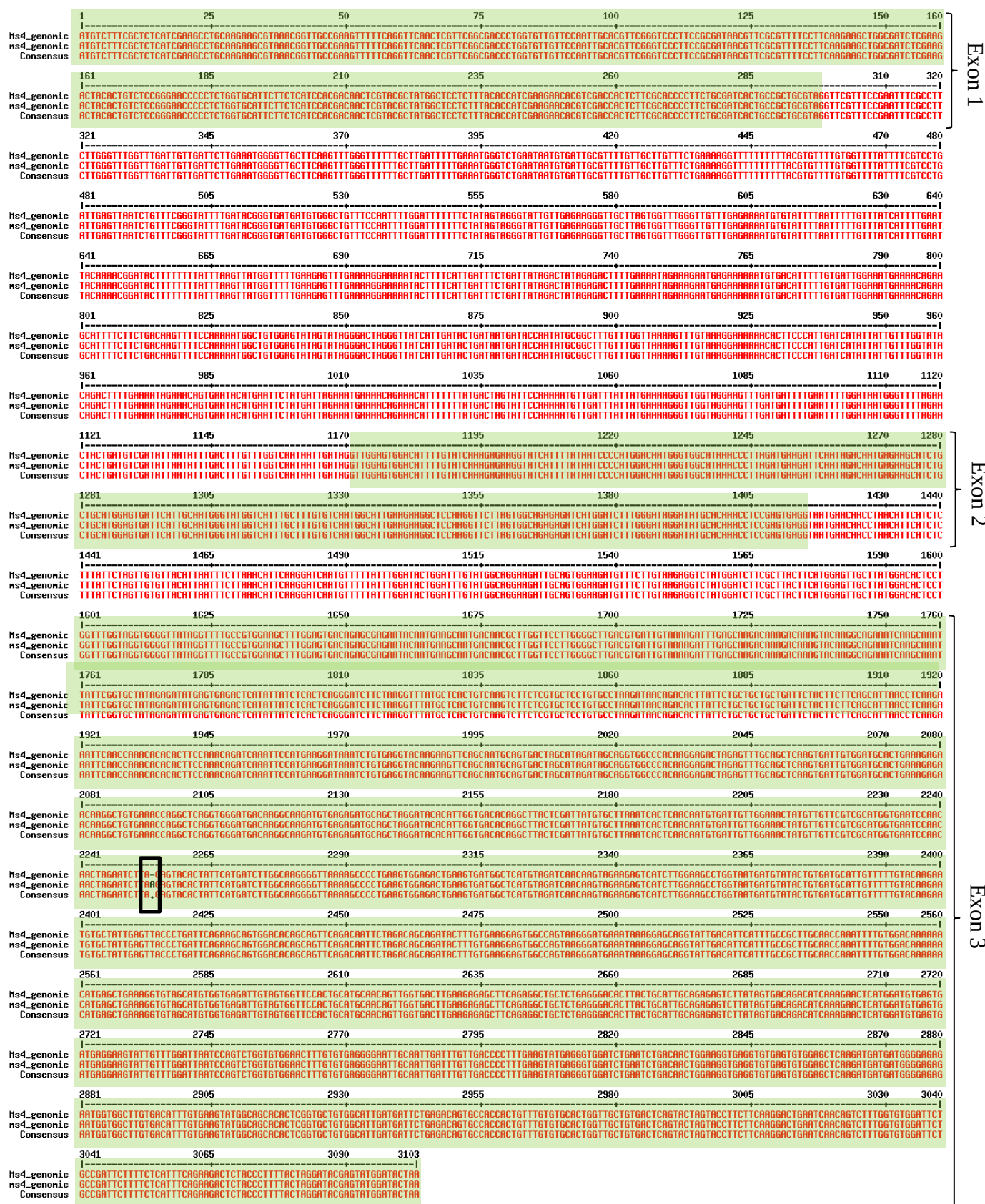


Figure S1. Sequence comparison of the genomic DNA sequences showed an insertion of a single nucleotide “A” in the 3rd exon of the *MS4* gene *Glyma.02G243200* in the male sterile (*ms4/ms4*) line. Green color boxes represent expected exonic sequences. Insertion mutation is shown by black color box.

Wild type	(MS4)	MSFALIEACKKRRLPKFFRFNSFGDPGVVPIARSGPFRDNVRVFLQEAGDLEDYTVSGN
Mutant	(ms4)	MSFALIEACKKRRLPKFFRFNSFGDPGVVPIARSGPFRDNVRVFLQEAGDLEDYTVSGN *****
Wild type	(MS4)	PLWCILLIHDNSYAMAPLYTIEEHVDHSSHPFCDHCRCVGS GHFVSKRRYHFIIIPMDNG
Mutant	(ms4)	PLWCILLIHDNSYAMAPLYTIEEHVDHSSHPFCDHCRCVGS GHFVSKRRYHFIIIPMDNG *****
Wild type	(MS4)	WHKPLDEDSIDNEKHLHLHGVIHCNGYGHL LCVNGIEEGSKVLSGREIMDLWDRICTNLRV
Mutant	(ms4)	WHKPLDEDSIDNEKHLHLHGVIHCNGYGHL LCVNGIEEGSKVLSGREIMDLWDRICTNLRV *****
Wild type	(MS4)	RKIAVEDVSCKRSM DLRL LHGVAYGHSWFGRWGYRFCRGSFGVTEREYNEAMTTLGSLGL
Mutant	(ms4)	RKIAVEDVSCKRSM DLRL LHGVAYGHSWFGRWGYRFCRGSFGVTEREYNEAMTTLGSLGL *****
Wild type	(MS4)	DVIVKDL SKTKTKYKAEIKQI IRCYRDMSETHIISLRDLLRFMLTVKSSRAPVPKITDTY
Mutant	(ms4)	DVIVKDL SKTKTKYKAEIKQI IRCYRDMSETHIISLRDLLRFMLTVKSSRAPVPKITDTY *****
Wild type	(MS4)	SAAADSTSSALT SRNSTKHTLPNRSNSMKDKSVRYKKFSNAVTSIDSRWPTRRLEFAAQV
Mutant	(ms4)	SAAADSTSSALT SRNSTKHTLPNRSNSMKDKSVRYKKFSNAVTSIDSRWPTRRLEFAAQV *****
Wild type	(MS4)	IVDALKENKAVKPGSGGMTRQDVRDAARIHIGDTGLLDYVLKSLNNVIVGNYVVRMVNP
Mutant	(ms4)	IVDALKENKAVKPGSGGMTRQDVRDAARIHIGDTGLLDYVLKSLNNVIVGNYVVRMVNP *****
Wild type	(MS4)	TTRILEYTIHDLGKGLKAPEVETEVMAHVDQQVEESSWKPGNDVYCDALFLYKNVLLSYF
Mutant	(ms4)	TTRILRVHYS*----- *****.
Wild type	(MS4)	DSEAVDTAVQTILDSRYFVKWEPVRDEIKEQVLT FICRLQPNFVDKKHELKGVACGEIVV
Mutant	(ms4)	-----
Wild type	(MS4)	VPLHATVGDLKRASEAALRD TYCIAESLIVTDIKELMDVSDEEVLFGLIQSGVELCVRGI
Mutant	(ms4)	-----
Wild type	(MS4)	AIDLLTPLKYEGGSESDNWKVR
Mutant	(ms4)	-----
Wild type	(MS4)	LFVCTGC
Mutant	(ms4)	-----

Plant Homeodomain

CECGAQDDDDGERMVACDICEVWQHTRCCGIDDSETVPP

Figure S2. Amino acid alignment showing a frameshift mutation resulted in an early stop codon in *ms4* sterile mutant. The resulting truncated protein lacks the Plant Homeodomain (PHD) which is otherwise present at the C-terminus of native MS4 protein.

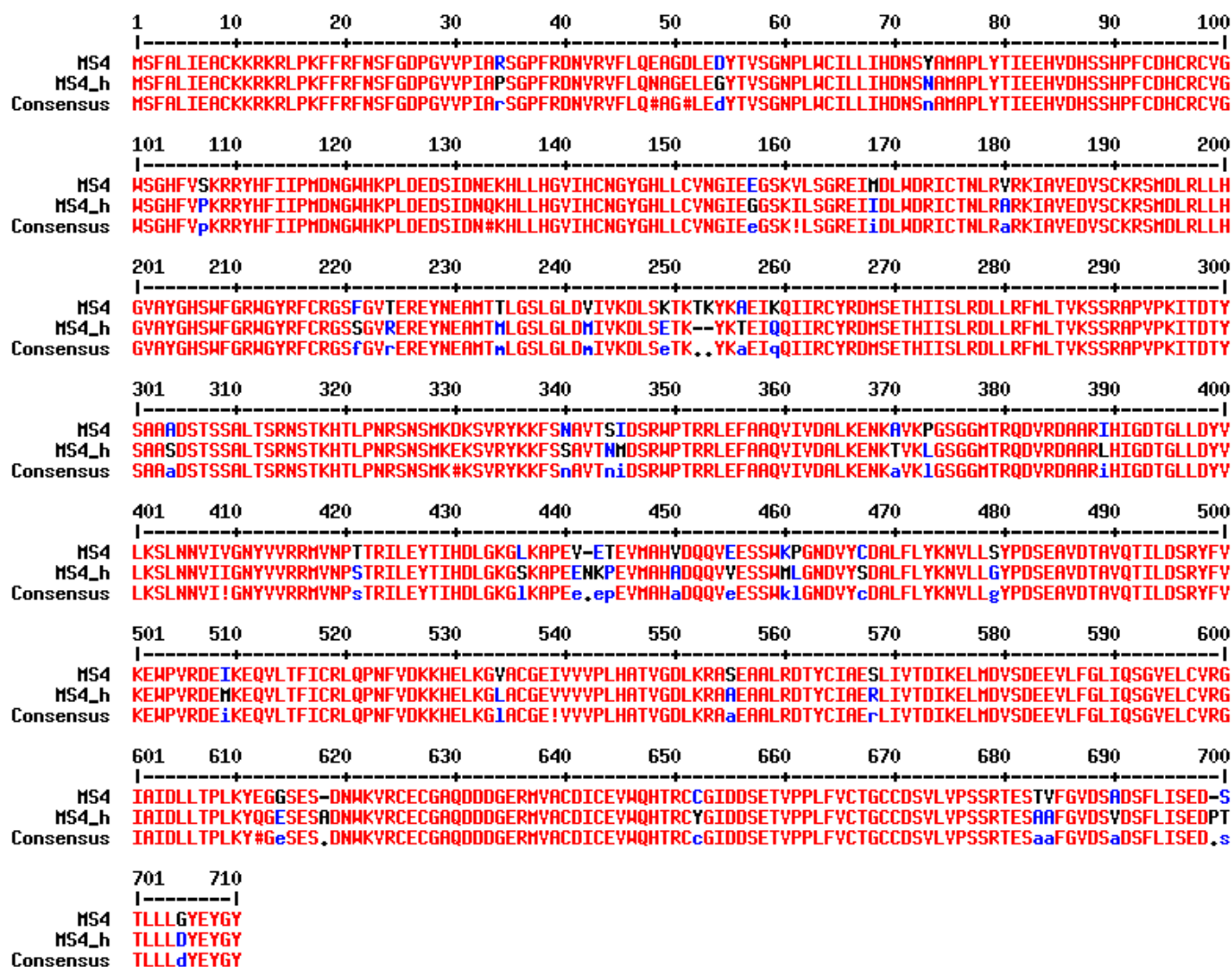


Figure S4. Similarity comparison of the soybean MS4 and MS4_HOMOLOG amino acid sequences.

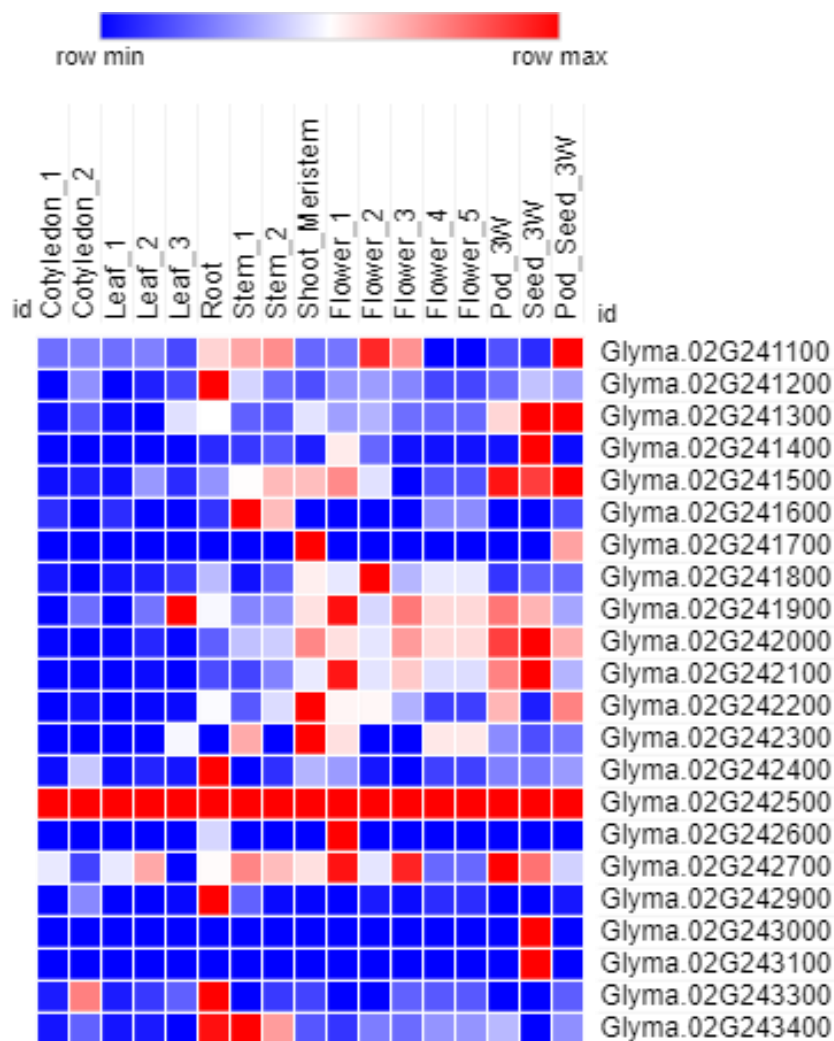
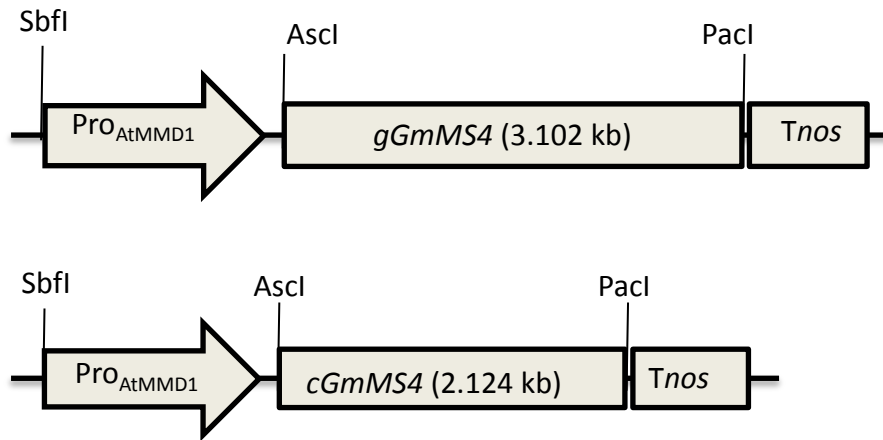


Figure S5. Heatmap representing the expression of the remaining 22 genes present in the mapped region.

(A) Complementation constructs for *GmMS4*



(B) Complementation constructs for *GmMS4* homolog

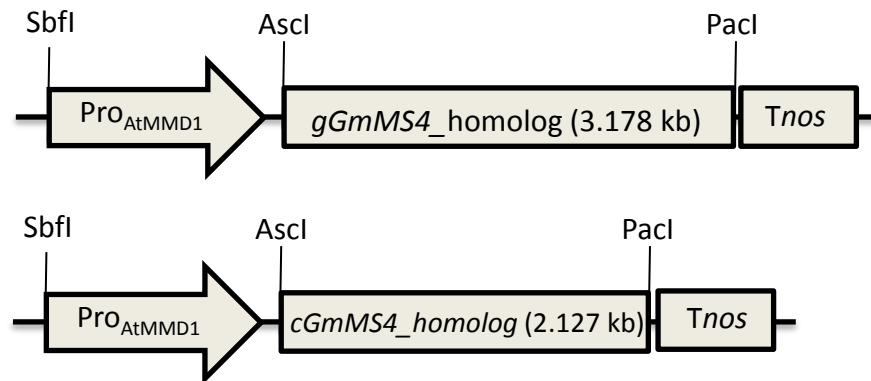


Figure S6. Constructs used for the complementation purposes. **(A)** Arabidopsis *MMD1* native promoter driven genomic and CDS *GmMS4* constructs. **(B)** Arabidopsis *MMD1* native promoter driven genomic and CDS *GmMS4_homolog* constructs.

Table S1. A list of 23 predicted genes in the *ms4* region flanked by BARCSOYSSR_02_1515 and BARCSOYSSR_02_1528.

Gene	Start Position	End Position	Predicted Function	Protein Homologs of Interest
BARCSOYSSR_02_1515	42933726	42933751		
<i>Glyma.02G241100</i>	42951620	42957971	UTP--glucose-1-phosphate uridylyltransferase	UTP-glucose-1-phosphate uridylyltra
<i>Glyma.02G241200</i>	42962596	42968168	Isocitrate/isopropylmalate dehydrogenase	NADP-dependent isocitrate dehydrog
<i>Glyma.02G241300</i>	42970608	42978869	ABC1 family	Ubiquinone biosynthesis protein coq-8
<i>Glyma.02G241400</i>	42982745	42989316	Pyridoxal-dependent decarboxylase conserved domain	glutamate decarboxylase/similar to glutamate decarboxylase
<i>Glyma.02G241500</i>	42993453	42995521	Protein kinase domain/Legume lectin domain	L-type lectin-domain receptor kinase/Concanavalin A-like lectin protein
<i>Glyma.02G241600</i>	43010950	43012781	Universal stress protein family	adenine nucleotide alpha hydrolase s/conserved hypothetical protein
<i>Glyma.02G241700</i>	43015662	43017206	-	hypothetical protein
<i>Glyma.02G241800</i>	43022047	43025937	Endomembrane protein 70	transmembrane 9 family protein
<i>Glyma.02G241900</i>	43026406	43032363	PRP38 family	pre-mRNA-splicing factor
<i>Glyma.02G242000</i>	43046963	43048202	Protein of unknown function (DUF775)	Conserved gene of unknown/Uncharacterized protein (80%P)
<i>Glyma.02G242100</i>	43072169	43078866	Myb-like DNA-binding domain	transcription factor KAN2/KANADI like transcription factor
<i>Glyma.02G242200</i>	43083001	43085280	-	transmembrane protein, putative
<i>Glyma.02G242300</i>	43088016	43088773	Fasciclin domain	fasciclin-like arabinogalactan protein/conserved hypothetical protein
<i>Glyma.02G242400</i>	43091693	43094869	EARLY GROWTH RESPONSE PROTEIN-RELATED	similar to Zinc finger protein 4.; [co-ort
<i>Glyma.02G242500</i>	43094090	43094618	-	-
<i>Glyma.02G242600</i>	43103386	43105141	EARLY GROWTH RESPONSE PROTEIN-RELATED	similar to Zinc finger protein 4.; [co-ort
<i>Glyma.02G242700</i>	43112302	43114330	Leucine Rich Repeat/Leucine rich repeat N-terminal domain	receptor protein kinase, putative
<i>Glyma.02G242900</i>	43122457	43123773	U-box domain	Avr9/Cf-9 rapidly elicited protein/similar to U-box domain-containing
<i>Glyma.02G243000</i>	43126795	43128276	B-box zinc finger	PLATZ transcription factor family pr
<i>Glyma.02G243100</i>	43129307	43129745	PLATZ transcription factor	PLATZ transcription factor family pr
<i>Glyma.02G243200</i>	43132339	43135440	MIXED-LINEAGE LEUKEMIA 5, MLL5	PHD finger protein MALE meiocyte D
<i>Glyma.02G243300</i>	43137148	43137878	-	-
<i>Glyma.02G243400</i>	43138504	43148118	Cyclic nucleotide-binding domain/Ankyrin repeat	potassium outward rectifying channel
BARCSOYSSR_02_1528	43149577	43149616		

Table S2. Details of primers used in present study for various purposes.

Primer name	Sequence (5'-3')
A. For amplification of <i>Glyma.02G243200</i>	
MS4_F1	GGATTGTTCCCTGGACTAGTTCATTGTAGTTTTTGTGTTGTTGGG
MS4_F2	AAATTCCAATGACCCTAAAGGAGGGTTAGTATACAATAAACTAACCAAGTCCCTT
MS4_F3	AGCAAACAGAAATTCGACCATTCACTTCATTTACTCATTGACTAGTTTCTC
MS4_R1	ATTTGTTGGAGATAGCTTATCTCTTTTTTCCAAAAATAAATTCGATGTGCTATATAGTCCC
MS4_R2	TGCAACTACTCACCTACAACCTTCTCTAATATTTTTGTAACCTACCTCATTTCACCTATTATCTGATTCTA
MS4_R3	CACTCTCCTCACTCTTTCCACGTCCTTCTCTCATTAGAATTCTCTCTC
B. For sequencing of MS4	
MS4 1F	GGGCCTTGGGCCATTCTTAT
MS4 1R	TTCGGAACGAACCTACGCA
MS4 2F	TCGTCGCATGGTGAATCCAA
MS4 2R	TCGGCAGAATCCACACCAAA
MS4 3F	CGTGCTCCTGTGCCTAAGAT
MS4 3R	GAGCTCCACACTCACACCTC
MS4 4F	TGCACAAACCTCCGAGTGAG
MS4 4R	TGGATTCACCATGCGACGAA
MS4 5F	GCTGAAAGGTGTAGCATGTGG
MS4 5R	AGATCTAGTCATACACCACTTTGT
MS4 6F	CTACACTGTCTCCGGAACC
MS4 6R	GGGTTTATGCCACCCATTGT
MS4 7F	AGGGTTGCTTAGTGTTTGGG
MS4 7R	GTCACCTCAAAGCTTCCACG
MS4 8F	GGCAGGAAGATTGCAGTGGA
MS4 8R	AAATTTGGTTGCAAGCGGCA
MS4 9F	TGTGATTGCGTTTTGTGCT
MS4 9R	AGGGTTTATGCCACCCATTGT
MS4 10F	TTGAGAAGGGTTGCTTAGTGGT
MS4 10R	ACGGCAAAACCTATAACCCCA
MS4 11F	GGCTCAGGTGGGATGACAAG
MS4 11R	CCGAGTGTGCTGCCATACTT
MS4 12F	AAGCCCCTGAAGTGAGACT
MS4 12R	AGGGACGTTAACACACCTCAC
C. For Functional Characterization	
AtMMD1_pro_F	tcccCCTGCAGGGAACGGGTGATTACAAAAATTTAAACTTGG
AtMMD1_pro_R	gcttGGCGCGCCGAATCAGAAATTTGGTTTGATCTTGAGAAG
MS4_AscI_F	gcttGGCGCGCCATGTCTTTCGCTCTCATCGAAGC
MS4_PacI_R	ggccTTAATTAAATTAGTATCCATACTCGTATCCTAGTAAAAGGGTAG

Table S3. Duplication gene list of syntenic block 245 between soybean chr02-chr14 with *MS4* and *MS4_homolog* as duplicated gene pair (highlighted in yellow).

BLOCK Number	BLOCK SCORE	E_VALUE	LOCUS_1	LOCUS_2	Ka	Ks
245	9852	2.00E-158	Glyma.02G208200	Glyma.14G176300	0.2327	1.5595
245	9852	0	Glyma.02G208400	Glyma.14G176600	0.021	0.1493
245	9852	0	Glyma.02G208500	Glyma.14G176700	0.0167	0.0787
245	9852	1.00E-159	Glyma.02G208600	Glyma.14G176800	0.0334	0.0943
245	9852	0	Glyma.02G208700	Glyma.14G176900	0.0078	0.1338
245	9852	1.00E-43	Glyma.02G208800	Glyma.14G177000	0.0502	0.2403
245	9852	5.00E-106	Glyma.02G208900	Glyma.14G177100	0.0202	0.0881
245	9852	0	Glyma.02G209000	Glyma.14G177200	0.0206	0.1049
245	9852	0	Glyma.02G209100	Glyma.14G177300	0.0215	0.0943
245	9852	2.00E-81	Glyma.02G209200	Glyma.14G177400	0.0541	0.135
245	9852	0	Glyma.02G209400	Glyma.14G177500	0.0451	0.336
245	9852	7.00E-71	Glyma.02G209500	Glyma.14G177600	0.0831	0.2892
245	9852	0	Glyma.02G209600	Glyma.14G177700	0.0303	0.1387
245	9852	1.00E-62	Glyma.02G210000	Glyma.14G177800	0.2632	0.6246
245	9852	0	Glyma.02G210400	Glyma.14G177900	0.0534	0.1816
245	9852	1.00E-170	Glyma.02G210500	Glyma.14G178000	0.027	0.1415
245	9852	0	Glyma.02G210600	Glyma.14G178200	0.0807	0.1765
245	9852	0	Glyma.02G210800	Glyma.14G178500	0.0499	0.1517
245	9852	0	Glyma.02G211200	Glyma.14G178800	0.0247	0.0817
245	9852	0	Glyma.02G211300	Glyma.14G178900	0.0244	0.0979
245	9852	0	Glyma.02G211400	Glyma.14G179000	0.039	0.1274
245	9852	1.00E-92	Glyma.02G211500	Glyma.14G179100	0.0233	0.1854
245	9852	4.00E-155	Glyma.02G211600	Glyma.14G179200	0.0273	0.145
245	9852	0	Glyma.02G211700	Glyma.14G179300	0.0344	0.151
245	9852	0	Glyma.02G211800	Glyma.14G179500	0.0332	0.1997
245	9852	1.00E-115	Glyma.02G211900	Glyma.14G179600	0.0386	0.17
245	9852	1.00E-99	Glyma.02G212100	Glyma.14G179800	0.029	0.1357
245	9852	0	Glyma.02G212200	Glyma.14G179900	0.0626	0.1481
245	9852	3.00E-34	Glyma.02G212300	Glyma.14G180100	0.0166	0.1487
245	9852	0	Glyma.02G212400	Glyma.14G180300	0.0321	0.1034
245	9852	1.00E-68	Glyma.02G212500	Glyma.14G180400	0.197	0.5054
245	9852	9.00E-141	Glyma.02G212600	Glyma.14G180500	0.0213	0.1298
245	9852	0	Glyma.02G212700	Glyma.14G180600	0.0139	0.0986
245	9852	2.00E-113	Glyma.02G213000	Glyma.14G180700	0.0839	0.3886
245	9852	2.00E-142	Glyma.02G213200	Glyma.14G180800	0.0327	0.2098
245	9852	6.00E-10	Glyma.02G213300	Glyma.14G180900	0.0498	0.2884
245	9852	0	Glyma.02G213400	Glyma.14G181100	0.0502	0.1126
245	9852	1.00E-123	Glyma.02G213500	Glyma.14G181200	0.0961	0.3059
245	9852	0	Glyma.02G213600	Glyma.14G181300	0.0127	0.0965
245	9852	2.00E-93	Glyma.02G213700	Glyma.14G181400	0.0424	0.0839
245	9852	2.00E-118	Glyma.02G213800	Glyma.14G181500	0.0592	0.1642
245	9852	6.00E-168	Glyma.02G213900	Glyma.14G181600	0.0699	0.3069
245	9852	0	Glyma.02G214300	Glyma.14G181800	0.0273	0.1089
245	9852	2.00E-109	Glyma.02G214400	Glyma.14G181900	0.0181	0.133
245	9852	0	Glyma.02G214500	Glyma.14G182000	0.0497	0.1246

245	9852	0	Glyma.02G214700	Glyma.14G182100	0.0477	0.1047
245	9852	0	Glyma.02G215000	Glyma.14G182300	0.0378	0.1362
245	9852	0	Glyma.02G215100	Glyma.14G182400	0.0415	0.1056
245	9852	0	Glyma.02G215200	Glyma.14G182500	0.0149	0.0923
245	9852	0	Glyma.02G215300	Glyma.14G182700	0.0338	0.1532
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245	9852	0	Glyma.02G216000	Glyma.14G183000	0.0231	0.0852
245	9852	2.00E-74	Glyma.02G216100	Glyma.14G183100	0.0082	0.1046
245	9852	4.00E-25	Glyma.02G216200	Glyma.14G183300	0.0187	0.1074
245	9852	5.00E-88	Glyma.02G216500	Glyma.14G183500	0.2046	0.4071
245	9852	1.00E-141	Glyma.02G216600	Glyma.14G183800	0.0315	0.0687
245	9852	6.00E-12	Glyma.02G216800	Glyma.14G184100	0.6474	0.6045
245	9852	0	Glyma.02G216900	Glyma.14G184200	0.0345	0.0835
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245	9852	0	Glyma.02G219400	Glyma.14G186800	0.0496	0.1098
245	9852	2.00E-16	Glyma.02G220200	Glyma.14G187600	0.225	0.3758
245	9852	1.00E-93	Glyma.02G220800	Glyma.14G188200	0.0202	0.1679
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245	9852	2.00E-111	Glyma.02G221100	Glyma.14G188600	0.0182	0.1586
245	9852	4.00E-172	Glyma.02G221200	Glyma.14G188700	0.0317	0.163
245	9852	4.00E-97	Glyma.02G221300	Glyma.14G188800	0.0403	0.0819
245	9852	2.00E-40	Glyma.02G221700	Glyma.14G189000	0.028	0.1621
245	9852	0	Glyma.02G221900	Glyma.14G189100	0.0223	0.1521
245	9852	0	Glyma.02G222000	Glyma.14G189200	0.0865	0.2872
245	9852	0	Glyma.02G222300	Glyma.14G189300	0.0522	0.1309
245	9852	0	Glyma.02G222400	Glyma.14G189400	0.0227	0.1169
245	9852	5.00E-105	Glyma.02G222600	Glyma.14G189500	0.0242	0.1354
245	9852	2.00E-53	Glyma.02G222700	Glyma.14G189600	0.079	0.141
245	9852	9.00E-23	Glyma.02G222800	Glyma.14G189700	0.0901	0.3757
245	9852	0	Glyma.02G222900	Glyma.14G189900	0.0228	0.0701
245	9852	0	Glyma.02G223100	Glyma.14G190000	0.0114	0.0998
245	9852	0	Glyma.02G223300	Glyma.14G190100	0.0212	0.134
245	9852	0	Glyma.02G223400	Glyma.14G190200	0.0191	0.0753

245	9852	4.00E-92	Glyma.02G223600	Glyma.14G190300	0.0203	0.2029
245	9852	0	Glyma.02G223700	Glyma.14G190400	0.0245	0.0929
245	9852	0	Glyma.02G223800	Glyma.14G190500	0.0551	0.1291
245	9852	0	Glyma.02G223900	Glyma.14G190600	0.0198	0.1262
245	9852	0	Glyma.02G224000	Glyma.14G190700	0.0212	0.1072
245	9852	1.00E-53	Glyma.02G224100	Glyma.14G190800	0	0.5871
245	9852	0	Glyma.02G224200	Glyma.14G190900	0.0293	0.1375
245	9852	2.00E-50	Glyma.02G224300	Glyma.14G191000	0.0771	0.133
245	9852	0	Glyma.02G224400	Glyma.14G191100	0.0503	0.1778
245	9852	0	Glyma.02G224600	Glyma.14G191300	0.0388	0.1669
245	9852	2.00E-113	Glyma.02G224700	Glyma.14G191400	0.0944	0.2085
245	9852	0	Glyma.02G224800	Glyma.14G191500	0.0099	0.1402
245	9852	0	Glyma.02G224900	Glyma.14G191700	0.0234	0.1175
245	9852	0	Glyma.02G225000	Glyma.14G191900	0.041	0.1096
245	9852	0	Glyma.02G225200	Glyma.14G192000	0.0729	0.1042
245	9852	0	Glyma.02G225300	Glyma.14G192100	0.0156	0.0813
245	9852	0	Glyma.02G225400	Glyma.14G192200	0.0444	0.1331
245	9852	2.00E-128	Glyma.02G225500	Glyma.14G192300	0.0287	0.1242
245	9852	9.00E-65	Glyma.02G225600	Glyma.14G192400	0.0407	0.0965
245	9852	0	Glyma.02G225700	Glyma.14G192600	0.1009	0.1963
245	9852	0	Glyma.02G225800	Glyma.14G192800	0.0907	0.2349
245	9852	0	Glyma.02G226100	Glyma.14G192900	0.0538	0.1037
245	9852	0	Glyma.02G226200	Glyma.14G193000	0.0592	0.2063
245	9852	0	Glyma.02G226300	Glyma.14G193200	0.0209	0.1096
245	9852	9.00E-124	Glyma.02G226400	Glyma.14G193300	0.0438	0.1018
245	9852	0	Glyma.02G226500	Glyma.14G193400	0.0207	0.1193
245	9852	0	Glyma.02G226600	Glyma.14G193500	0.0339	0.1829
245	9852	0	Glyma.02G226700	Glyma.14G193600	0.0347	0.1111
245	9852	1.00E-135	Glyma.02G226800	Glyma.14G193800	0.0428	0.1198
245	9852	0	Glyma.02G226900	Glyma.14G193900	0.0337	0.1564
245	9852	0	Glyma.02G227000	Glyma.14G194100	0.0355	0.1273
245	9852	0	Glyma.02G227100	Glyma.14G194200	0.0736	0.1532
245	9852	0	Glyma.02G227200	Glyma.14G194300	0.0232	0.1337
245	9852	0	Glyma.02G227300	Glyma.14G194400	0.0242	0.1144
245	9852	2.00E-108	Glyma.02G227600	Glyma.14G194500	0.0292	0.1466
245	9852	0	Glyma.02G227700	Glyma.14G194600	0.0189	0.0809
245	9852	0	Glyma.02G227900	Glyma.14G194800	0.0601	0.1345
245	9852	0	Glyma.02G228000	Glyma.14G194900	0.0465	0.0877
245	9852	0	Glyma.02G228100	Glyma.14G195000	0.0082	0.0791
245	9852	0	Glyma.02G228200	Glyma.14G195200	0.0187	0.1155
245	9852	0	Glyma.02G228300	Glyma.14G195300	0.078	0.1625
245	9852	0	Glyma.02G228400	Glyma.14G195400	0.007	0.0962
245	9852	0	Glyma.02G228600	Glyma.14G195600	0.035	0.0942
245	9852	0	Glyma.02G228700	Glyma.14G195700	0.0182	0.0898
245	9852	3.00E-107	Glyma.02G228800	Glyma.14G195900	0.0634	0.1921
245	9852	8.00E-62	Glyma.02G228900	Glyma.14G196000	0.1249	0.2429
245	9852	0	Glyma.02G229700	Glyma.14G196800	0.0157	0.1121

245	9852	4.00E-88	Glyma.02G230200	Glyma.14G197300	0.0407	0.3785
245	9852	0	Glyma.02G230300	Glyma.14G197400	0.07	0.1635
245	9852	5.00E-81	Glyma.02G230400	Glyma.14G197500	0.0617	0.1346
245	9852	0	Glyma.02G230500	Glyma.14G197600	0.0055	0.1234
245	9852	1.00E-90	Glyma.02G230600	Glyma.14G197700	0.091	0.1722
245	9852	7.00E-173	Glyma.02G230700	Glyma.14G197800	0.0464	0.1101
245	9852	1.00E-121	Glyma.02G230800	Glyma.14G197900	0.0723	0.1688
245	9852	2.00E-172	Glyma.02G230900	Glyma.14G198000	0.4218	1.6266
245	9852	0	Glyma.02G231100	Glyma.14G198700	0.0287	0.0937
245	9852	0	Glyma.02G231200	Glyma.14G198800	0.0178	0.2107
245	9852	0	Glyma.02G231600	Glyma.14G198900	0.0116	0.2037
245	9852	0	Glyma.02G231800	Glyma.14G199000	0.0334	0.1654
245	9852	0	Glyma.02G232100	Glyma.14G199200	0.0347	0.2134
245	9852	2.00E-78	Glyma.02G232500	Glyma.14G199900	0.1094	0.249
245	9852	0	Glyma.02G232600	Glyma.14G200200	0.0223	0.1245
245	9852	0	Glyma.02G232700	Glyma.14G200300	0.0699	0.2075
245	9852	2.00E-153	Glyma.02G232800	Glyma.14G200400	0.0111	0.1046
245	9852	1.00E-119	Glyma.02G233000	Glyma.14G200600	0.0338	0.1101
245	9852	7.00E-119	Glyma.02G233100	Glyma.14G200700	0.0465	0.1498
245	9852	0	Glyma.02G233200	Glyma.14G201200	0.0479	0.1589
245	9852	3.00E-101	Glyma.02G233300	Glyma.14G201300	0.045	0.1313
245	9852	0	Glyma.02G233700	Glyma.14G201500	0.0204	0.104
245	9852	0	Glyma.02G233800	Glyma.14G201600	0.0281	0.1479
245	9852	3.00E-172	Glyma.02G233900	Glyma.14G201700	0.1823	0.7166
245	9852	0	Glyma.02G234200	Glyma.14G201800	0.0275	0.1027
245	9852	2.00E-150	Glyma.02G234300	Glyma.14G202000	0.0388	0.1586
245	9852	0	Glyma.02G234500	Glyma.14G202100	0.0286	0.1798
245	9852	2.00E-109	Glyma.02G234600	Glyma.14G202300	0.0319	0.0878
245	9852	6.00E-35	Glyma.02G234800	Glyma.14G202700	0.0732	0.2938
245	9852	3.00E-50	Glyma.02G234900	Glyma.14G202800	0.0946	0.146
245	9852	9.00E-38	Glyma.02G235000	Glyma.14G202900	0.229	0.3794
245	9852	0	Glyma.02G235100	Glyma.14G203000	0.0244	0.1955
245	9852	0	Glyma.02G235400	Glyma.14G203400	0.038	0.1343
245	9852	8.00E-103	Glyma.02G235500	Glyma.14G203500	0.0516	0.236
245	9852	0	Glyma.02G235600	Glyma.14G203600	0.0358	0.1292
245	9852	0	Glyma.02G235700	Glyma.14G203700	0.023	0.118
245	9852	0	Glyma.02G235800	Glyma.14G203800	0.0352	0.0931
245	9852	6.00E-167	Glyma.02G235900	Glyma.14G203900	0.012	0.0969
245	9852	6.00E-73	Glyma.02G236100	Glyma.14G204000	0.0912	0.1913
245	9852	0	Glyma.02G236200	Glyma.14G204100	0.0285	0.1458
245	9852	3.00E-157	Glyma.02G236300	Glyma.14G204200	0.0252	0.1692
245	9852	0	Glyma.02G236400	Glyma.14G204400	0.051	0.1181
245	9852	0	Glyma.02G236600	Glyma.14G205100	0.032	0.1175
245	9852	0	Glyma.02G236700	Glyma.14G205500	0.0147	0.062
245	9852	7.00E-134	Glyma.02G236800	Glyma.14G205600	0.0545	0.2289
245	9852	8.00E-110	Glyma.02G236900	Glyma.14G205700	0	0.1413
245	9852	0	Glyma.02G237000	Glyma.14G206000	0.0265	0.1771

245	9852	0	Glyma.02G237100	Glyma.14G206100	0.0293	0.1521
245	9852	4.00E-112	Glyma.02G237200	Glyma.14G206200	0.136	0.2773
245	9852	2.00E-74	Glyma.02G237400	Glyma.14G206500	0.2308	0.2795
245	9852	0	Glyma.02G237600	Glyma.14G206600	0.1002	0.1609
245	9852	3.00E-36	Glyma.02G237700	Glyma.14G206700	0.0975	0.337
245	9852	0	Glyma.02G237800	Glyma.14G206800	0.0304	0.107
245	9852	0	Glyma.02G238300	Glyma.14G207200	0.0144	0.1318
245	9852	0	Glyma.02G238400	Glyma.14G207300	0.0115	0.0663
245	9852	0	Glyma.02G238500	Glyma.14G207400	0.0627	0.1459
245	9852	0	Glyma.02G238600	Glyma.14G207500	0.0306	0.1474
245	9852	7.00E-148	Glyma.02G238700	Glyma.14G207600	0.0162	0.1619
245	9852	0	Glyma.02G238800	Glyma.14G207700	0.0183	0.2137
245	9852	0	Glyma.02G239000	Glyma.14G207900	0.0462	0.1388
245	9852	1.00E-120	Glyma.02G239100	Glyma.14G208000	0.0249	0.1508
245	9852	0	Glyma.02G239200	Glyma.14G208100	0.0411	0.0777
245	9852	0	Glyma.02G239300	Glyma.14G208200	0.0384	0.3072
245	9852	0	Glyma.02G239600	Glyma.14G208500	0.0104	0.1075
245	9852	1.00E-51	Glyma.02G239700	Glyma.14G208600	0	0.1804
245	9852	7.00E-72	Glyma.02G239800	Glyma.14G209000	0.0651	0.109
245	9852	1.00E-174	Glyma.02G239900	Glyma.14G209200	0.0767	0.1347
245	9852	0	Glyma.02G240000	Glyma.14G209400	0.0278	0.1259
245	9852	0	Glyma.02G240200	Glyma.14G209700	0.0616	0.1453
245	9852	0	Glyma.02G240300	Glyma.14G209800	0.064	0.1485
245	9852	0	Glyma.02G240400	Glyma.14G209900	0.0113	0.0986
245	9852	0	Glyma.02G240500	Glyma.14G210000	0.0331	0.1378
245	9852	6.00E-162	Glyma.02G240600	Glyma.14G210100	0.0058	0.1489
245	9852	0	Glyma.02G240700	Glyma.14G210200	0.0238	0.0941
245	9852	0	Glyma.02G240800	Glyma.14G210400	0.0191	0.1521
245	9852	1.00E-177	Glyma.02G240900	Glyma.14G210500	0.0187	0.1855
245	9852	0	Glyma.02G241000	Glyma.14G210600	0.0455	0.1291
245	9852	0	Glyma.02G241100	Glyma.14G210700	0.0302	0.1441
245	9852	0	Glyma.02G241200	Glyma.14G211000	0.0031	0.1103
245	9852	0	Glyma.02G241400	Glyma.14G211100	0.0174	0.1159
245	9852	0	Glyma.02G241500	Glyma.14G211200	0.024	0.181
245	9852	1.00E-95	Glyma.02G241600	Glyma.14G211300	0.0427	0.1028
245	9852	7.00E-125	Glyma.02G241700	Glyma.14G211400	0.056	0.0869
245	9852	0	Glyma.02G241800	Glyma.14G211500	0.0262	0.1132
245	9852	8.00E-177	Glyma.02G241900	Glyma.14G211600	0.0228	0.1209
245	9852	9.00E-137	Glyma.02G242000	Glyma.14G211800	0.0178	0.0861
245	9852	0	Glyma.02G242100	Glyma.14G211900	0.0461	0.1447
245	9852	1.00E-171	Glyma.02G242400	Glyma.14G212000	0.0153	0.1174
245	9852	0	Glyma.02G242700	Glyma.14G212100	0.0761	0.2238
245	9852	0	Glyma.02G242900	Glyma.14G212200	0.0366	0.1749
245	9852	0	Glyma.02G243200	Glyma.14G212300	0.0357	0.0986
245	9852	1.00E-25	Glyma.02G243300	Glyma.14G212400	0.0751	0.1301
245	9852	0	Glyma.02G243400	Glyma.14G212500	0.0242	0.1019
245	9852	0	Glyma.02G243500	Glyma.14G212600	0.0469	0.1235

245	9852	0	Glyma.02G243600	Glyma.14G212700	0.0375	0.209
245	9852	0	Glyma.02G243800	Glyma.14G212900	0.04	0.0752
245	9852	1.00E-47	Glyma.02G243900	Glyma.14G213200	1.1086	1.2322
245	9852	5.00E-136	Glyma.02G244100	Glyma.14G213400	0.016	0.0906
245	9852	1.00E-158	Glyma.02G244200	Glyma.14G213600	0.0408	0.1946
245	9852	0	Glyma.02G244700	Glyma.14G214300	0.0342	0.1659
245	9852	2.00E-63	Glyma.02G245000	Glyma.14G215100	0.0366	0.2114
245	9852	0	Glyma.02G245200	Glyma.14G215300	0.0426	0.1191
245	9852	0	Glyma.02G245300	Glyma.14G215400	0.016	0.0535
245	9852	0	Glyma.02G245400	Glyma.14G215500	0.0189	0.1113
245	9852	2.00E-66	Glyma.02G245600	Glyma.14G215600	0.0136	0.0776
245	9852	5.00E-93	Glyma.02G245700	Glyma.14G215800	0.0257	0.2063
245	9852	2.00E-158	Glyma.02G245800	Glyma.14G215900	0.0252	0.08
245	9852	4.00E-54	Glyma.02G245900	Glyma.14G216000	0.0262	0.1122
245	9852	0	Glyma.02G246000	Glyma.14G216100	0.0331	0.1187

Table S4. List of SRA files used for the expression analysis of *GmMS4* and *GmMS4_h*.

NCBI Accessions	Sample Name	Description
SRR117421 4	Cotyledon_1	Germination stage
SRR117422 8	Cotyledon_2	Trefoil stage
SRR117422 6	Leaf_1	Trefoil stage
SRR117422 9	Leaf_2	Flower bud differentiation stage
SRR117420 6	Leaf_3	Senescent leaves
SRR117420 5	Root	Germination stage
SRR117421 3	Stem_1	Germination stage
SRR117421 6	Stem_2	Trefoil stage
SRR117423 1	Shoot_meristem	Flower bud differentiation stage
SRR117423 2	Flower_1	Flower bud differentiation stage
SRR117421 7	Flower_2	Flowering stage: bud before flowering
SRR117421 8	Flower_3	Flowering stage: floescence
SRR117422 0	Flower_4	Flowering stage: 5 d after flowering
SRR117421 9	Flower_5	Flowering stage: floescence: different stage
SRR117422 1	Pod_3W	3 weeks old pod
SRR117421 1	Pod_seed_3W	3 weeks old pod_seed
SRR117422 2	Seed__3W	3 weeks old seed